A Summary of the Cassini System-Level Thermal Balance Test: Engineering subsystems

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ADS TRACT

Cassini, NASA's mission to investigate Saturn will be launched in October 1997. "l'he spacecraft is the largest and most sophisticated interplanetary vehicle ever launched. The cruise period is more than 7 years long and has a wide range solar/thermal environments (0.6 AU to 10 AU). To verify the integrated thermal design, the spacecraft will be tested in the 25 foot space simulator at the Jet Propulsion Laboratory in January 1997.

Although an extensive thermal development test program has been performed, the System-Level test will be the first opportunity to verify the propulsion module and Bus thermal designs. The propulsion module thermal design utilizes the waste heat from the RTG endome, a novel approach. Solar loads will be simulated with the spacecraft in a Sun-pointed configuration; off-Sun attitude simulation is not possible due to the large size of the spacecraft. A test of this magnitude has to incorporate several constraints which have a significant impact on the planning and execution of the test.

This paper will present the overall strategy for the System-1 .evel Thermal Balance 'l'est. The general objectives, test setup descriptions and test timelines will be presented (sample Figures attached). Focus will be placed on the RTG waste heat utilization for the propulsion module and any other engineering subsystem results which required design modifications. In addition, lessons learned will be presented.

Attached is an outline of the proposed paper

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Outline

I. introduction

- A. Mission Description
  - 1. Probe and Science Objectives
  - 2. Trajectories
- B. Spacecraft Configuration

II. Engineering Subsystem Thermal Design Description

111 System-Level Thermal Balance Test

- A. Scope and Objectives
- B. Test Configuration
- C. Test Timeline
- D. Results
  - 1. Summary
  - 2. Design Modifications
- E. Conclusions
- F. Lessons Learned

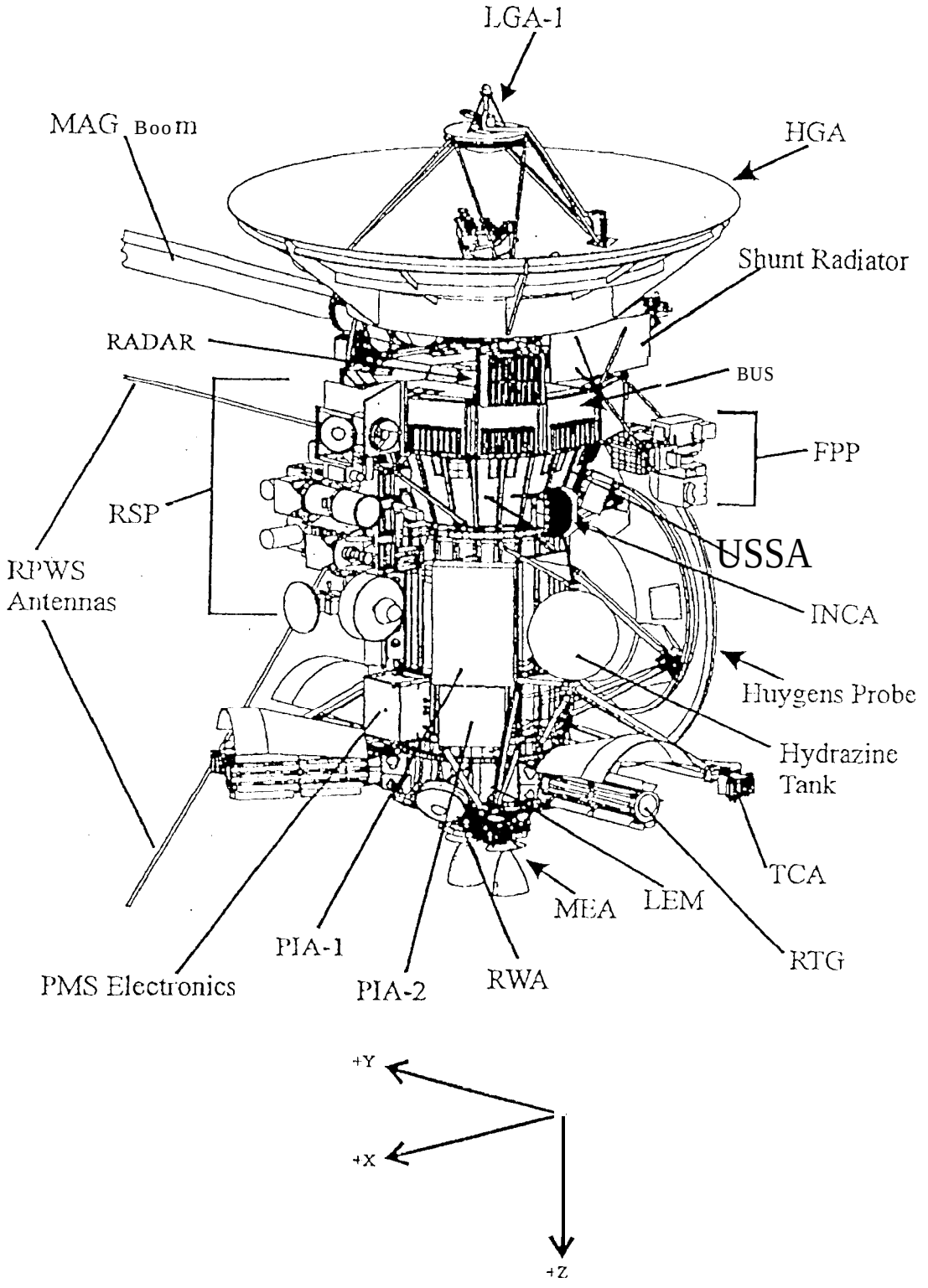

Figure 2 .0-a The Cassini Spacecraft

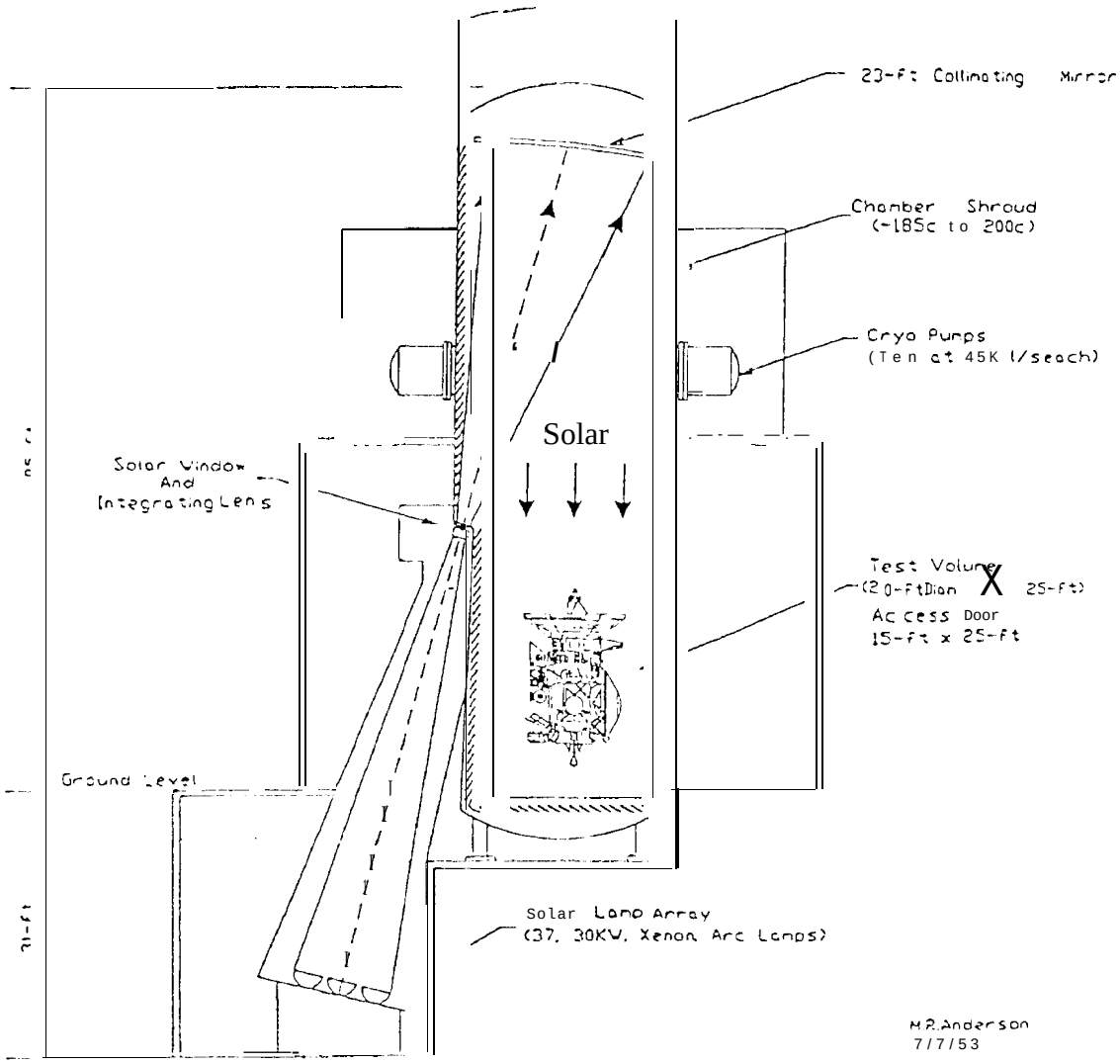

Figure 4.1-a The 25-ft Space Simulator

Figure 6.4-c

Cassini STV Test Phase 1 Event Timeline

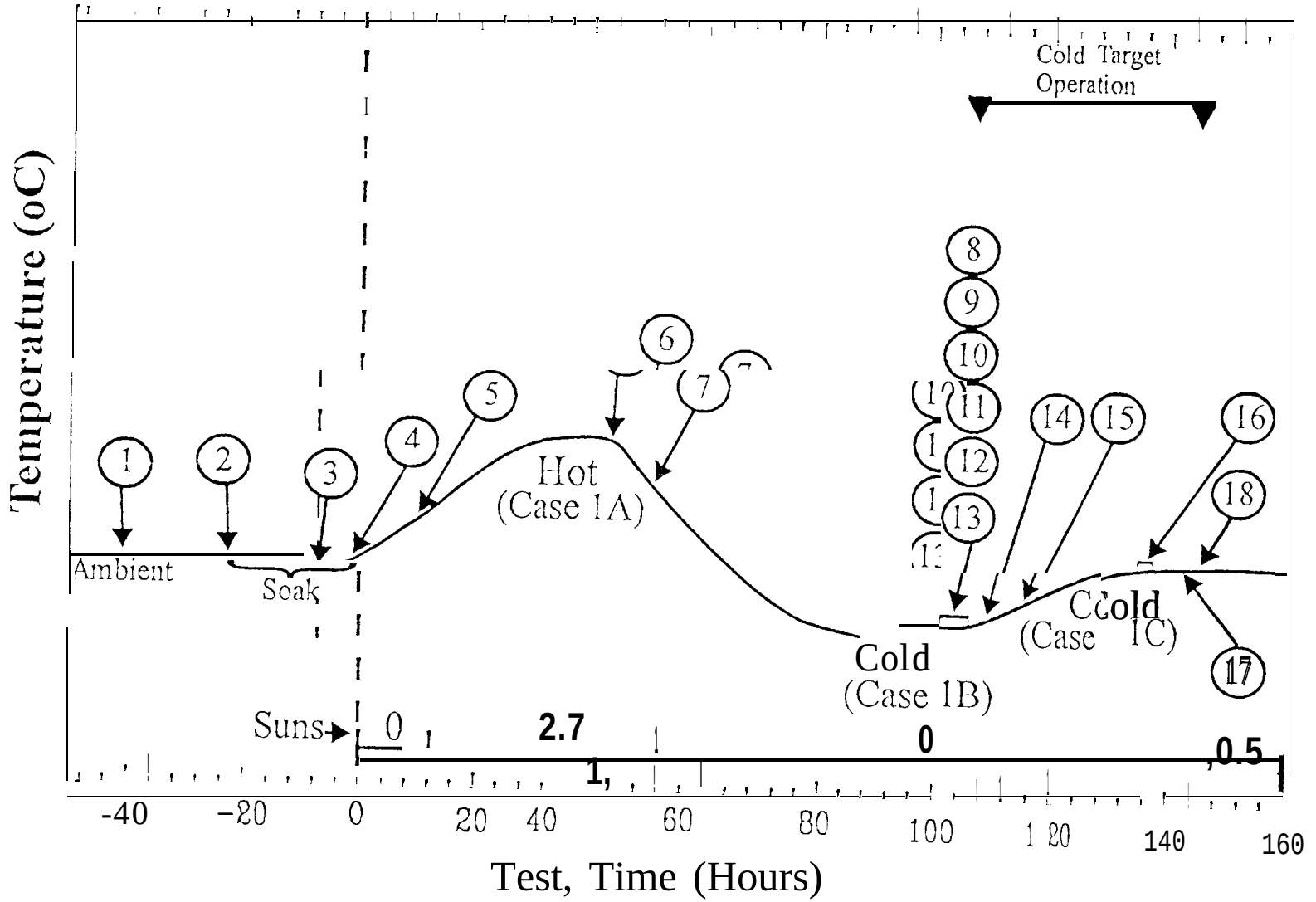

Figure 6.4-d

Cassini STV Test Phase 2 Event Timeline

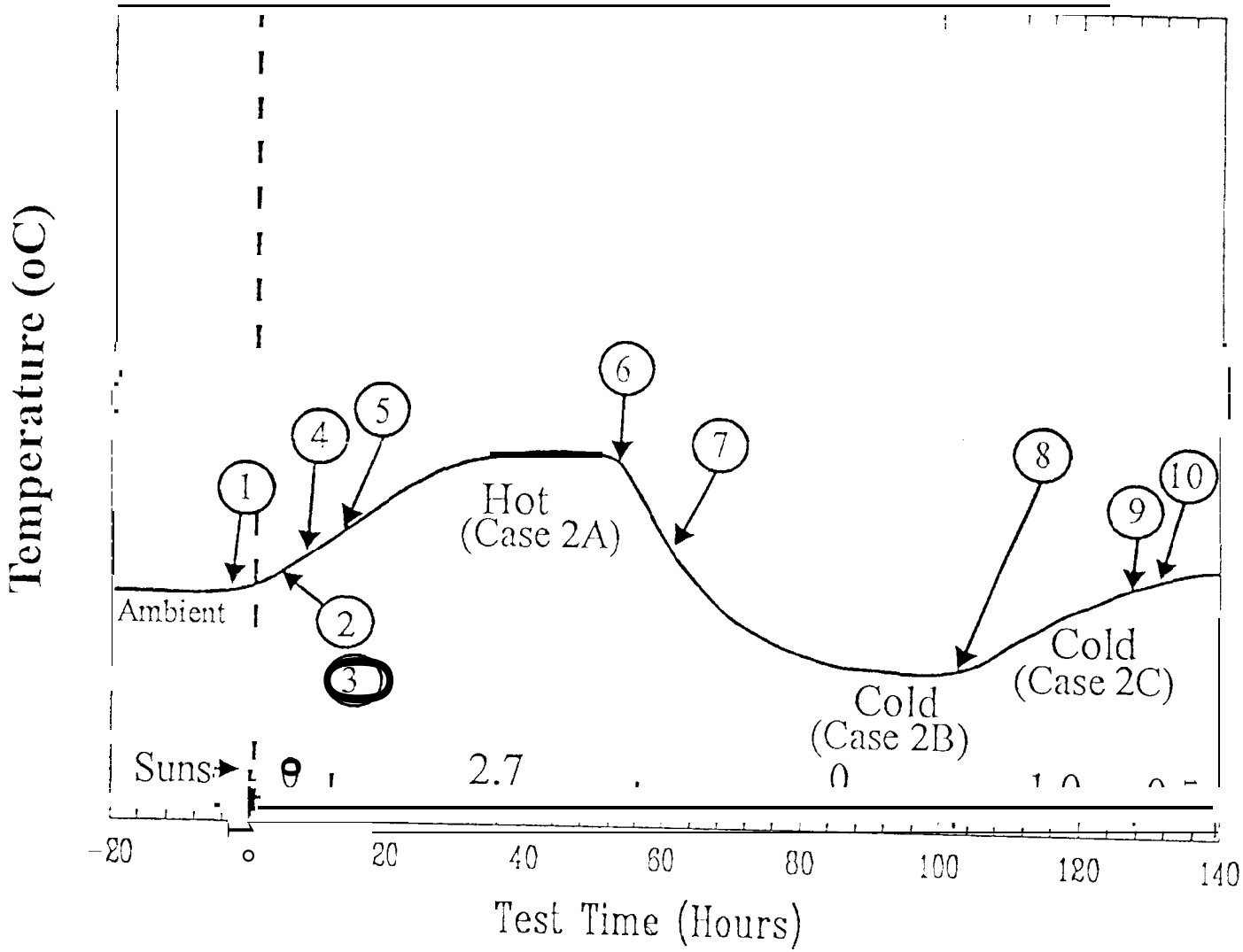

Table 6.4-A - STV Phase 1 Events

Event Nc	Description
1	S/C Baseline Test
2	Close Chamber
3	Nitrogen Flush Start Cooling Shrouds
4	Turn OFF Purge
5	Configure Power for Case 1A
6	Turn off Heaters TBD for Cooldown Acceleration
7	Configure Power for Case 1B
8	CIRS Interference Test
9	CAPS HV Test
10	CDA Interference Test
11	ISS Interference Test
12	Radar 30 minute Turn-ON
13	RWA 30 minute Turn-ON
14	Turn on Heaters for warm-up acceleration
15	Configure Power for Case 1 C
16	CIRS, VIMS & ISS Functional Tests and CIRS Microphonics Test
17	Configure Power for Backfill
18	turn ON Purge

Table 6.4-B - STV Phase 2 Events

Event No.	Description
1	Close Chamber
2	Start Cooling Shrouds
3	Turn on Heaters for warm-up acceleration
4	Turn OFF Purge
5	Configure Power for Case 2A
6	Turn off Heaters for Cooldown Acceleration
7	Configure Power for Case 2B
8	Configure Power for Case 2C
9	Configure Power for Back-fill
10	Turn ON Purge